System Specification

System Services Enhancement Thread, Thor DP1

Checkout and Launch Control System (CLCS)

84K00302-011

System Services Enhancement Thread

Assessment

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Version 2.0

System Services Enhancement Thread
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1. Introduction

1.1 System Services Enhancement Thread Overview.

The System Services Enhancement thread contains several CSC enhancements that are not included in any of the other Thor threads. These enhancements include the following:

1. Timer Services - provide the initial timer services support for the RTPS and synchronize platforms to GMT.
2. Interprocess Communications - provide an implementation of a CORBA-based IPC mechanism.
3. OPS Configuration Manager - provide enhancements to the platform configuration and initialization tool; implement modifications to support the new user login concept.
4. Access Control/Security - define and implement access control policies and auditing requirements for the RTPS.
5. Operating Systems - provide final version of the OS download utility; implement a help desk for the development and operational environments.

1.2 System Services Enhancement Thread Concept

1.2.1 Timer Services Concept

This thread will provide an initial delivery of timer services. Timer services will be provided through a set of Application Services APIs that will allow an application to get the current Coordinated Universal Time (UTC), Countdown Time (CDT) or Mission Elapsed Time (MET), request an interrupt after a specified elapsed time and request an interrupt when UTC, CDT or MET equals a specified value. Timer services will also provide CDT/MET capabilities to start, hold (immediately or at a specified time) and set CDT/MET. CDT/MET services will be provided by Application Services APIs and by a Command Support display. Another Command Support display will support the definition and display of local clocks as well as a stopwatch function.

The timer services architecture is shown in Figure 1-1. This figure shows a local timer server function on each C&C WS as well as a central timer server function on a CCP. The local and central timer functions are accessed through the Application Services APIs and the Timer GUI. Application Services will interface directly with the local timer server for local requests and will interface with Command Management to route CDT/MET commands to the central timer server. This use of Command Management will provide authentication of timer commands. The central timer server maintains the CDT/MET and publishes it as a system FD to data distribution at a cyclic rate. Data distribution then places this FD into the RTCN and DCN change data streams. CDT/MET are available to applications as an FD via Application Services.

The figure also shows how the Network Time server receives an IRIG-B signal and synchronizes the C&C WS, CCP and DDP clocks to GMT via the Network Timing Protocol (NTP). The NTP configuration was implemented as part of the Redstone delivery. This configuration will be reviewed and modified as required based on the changes to the network architecture.

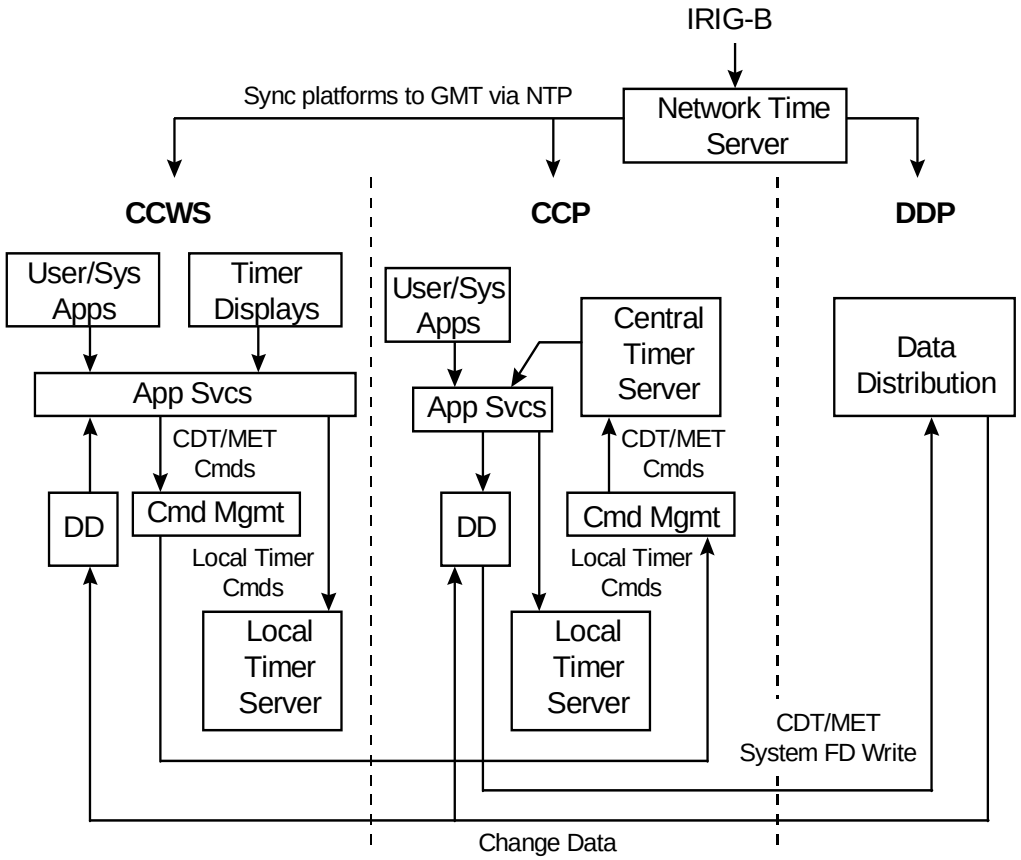

Figure 1-1. Timer Services Architecture

1.2.2 IPC Concept

This thread will provide an additional IPC service which will be based on the CORBA standard. This service will provide object-based communications for controlling and commanding of user applications such as EIM and TAS. The CORBA implementation will be based on a COTS product and will fit into the CLCS software architecture as shown in figure 1-2.

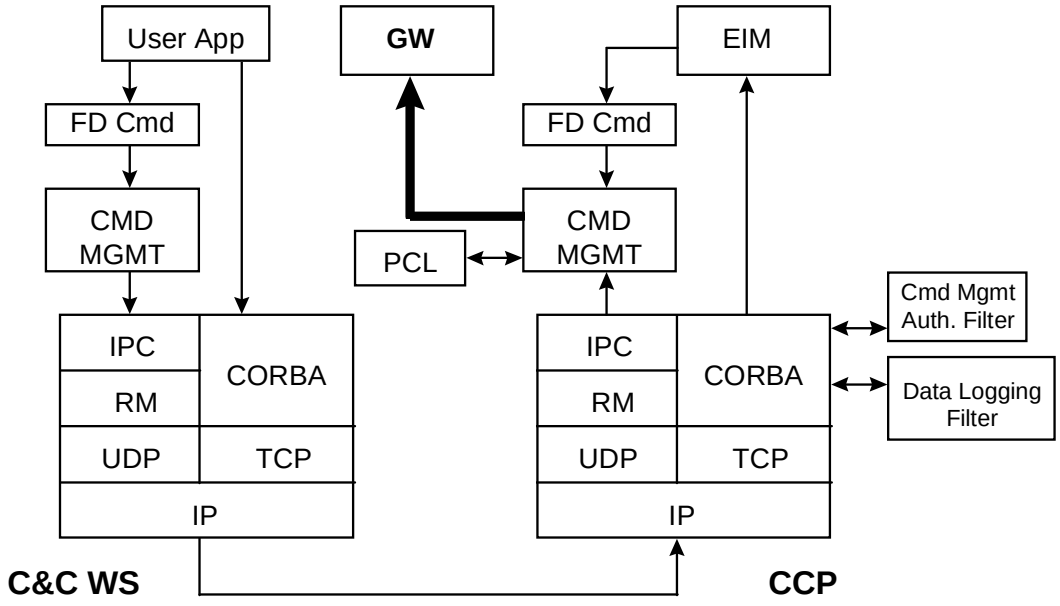

Figure 1-2. CORBA Architecture

This diagram shows that the command path for FD commanding remains unchanged in Thor and continues to use the Interprocess Communications software delivered in Redstone. The CORBA product will be installed in a standard COTS configuration and will not be interfaced to the Reliable Messaging protocol during the Thor timeframe. Two filters are shown; one will provide data logging to the SDC and the other will provide command management authentication for CORBA communications. EIM and TAS developers will use the product's IDL compiler to generate CORBA objects and methods. No higher level applications services will be provided to the CORBA product.

An initial procurement will be performed to provide a CORBA product to user application developers for the Thor delivery. This thread will also perform the procurement of a final CORBA product which will be delivered at the beginning of the Atlas delivery. In addition to a CORBA product, this thread will procure a set of standard C++ class libraries.

1.2.3 OPS Configuration Manager

During the Redstone delivery, the System Control CSCI/OPS CM CSC provided an initial delivery of the system build and test build load and initialization function. This function allows a user to check-in SCID and TCID build outputs, define CLCS activities, associate platforms with an activity, load SCID and TCID baselines onto each platform and initialize the SCID and TCID software. The current functionality supports a positional-based login scheme for CLCS users. The Thor delivery will delete support for positional-based logins and will add support for a no user login concept. In a no user login concept, user command authority is managed and allocated from a single C&C WS. A user login will be required only at the Master C&C WS. At this point, the Activity Manager user will be able to configure and initialize an entire test set. OPS CM will also provide support for the System Configuration Table (SCT) as defined by the System Integrity Thread.

1.2.4 Access Control/Security Concept

This thread will define a set of access control and audit policies to be implemented in the SDEs, IDE and operational sets. These policies will address user login, security and auditing requirements. These requirements will be implemented using standard COTS OS features and procedures. Each platform will record security/audit data per the defined policies. A set of tools/procedures will be developed to gather and analyze this security/audit data. Support will be provided to the CLCS DPI security accreditation and risk assessment.

1.2.5 Operating Systems Concept

During the Redstone delivery, the initial version of an OS download tool was provided. This tool installs baselined operating systems from the boot server to each CLCS platform (excluding gateways). During Thor, OS baselines loaded onto the boot server may come from the SDC instead of the SDE. This thread will provide enhancements to the OS download tool. These enhancements include reducing the size of the operational load and supporting different development and operational loads. This thread will also implement a formal help desk for the SDE's, IDE and HMF. This help desk will provide working hour support for user's questions and problems. The help desk will also resolve issues submitted to the help desk Razor issues database.

1.3 System Services Enhancement Thread Specification

1.3.1 Statement of Work

- Define the access control and security requirements and process to be employed in the IDE, HMF, and SDEs. This should include:
    - Access control and resolution of user login requirements and functionality
    - Definition of security incidents / events and the audit logging capabilities associated with these events
    - Procedures for processing of audit data
- Implement the initial access control capabilities as defined above

- Identify and implement the necessary updates to ~~complete~~ the remote configuration and platform initialization services provided by System Control / OPS CM in the Redstone Delivery.
- Define the timing requirements / capabilities needed in the CLCS Real-time Processing System. This should include:
    - Platform time synchronization across the Gateways, DDPs, CCPs, and HCIs. The utilization of Network Time Protocol (NTP) functions should be the foundation for this service.
    - Support for UTC, GMT, Count Down Clock~~, and incrementing and decrementing event timers~~
- Identify, design and implement the initial set of timing services capabilities from the above list.
- Provide the final Operating System server and Remote Installation capabilities required in the IDE, HMF, and SDEs. This should consider the use of servers within the SDC for staging and distributing OS updates.
- Provide a system administration help desk capability for the IDE, SDEs, and HMF.
- Provide an object based communication capability between user applications using CORBA's Interface Definition Language for interface specification. ~~Utilize CLCS Reliable Messages packets for the transport mechanism.~~ This capability should be an enhancement of or a replacement for the Inter-process Communications Services (IPC) services provided in Redstone.
    - Provide a set of standard C++ class libraries.
    - *Utilize CLCS Reliable Messages packets for the transport mechanism (Post-Thor).*

1.3.2 Requirements

This section contains a list of SLS and high level derived requirements that are driving the design of the capability.

(2.2.9.1.2) The RTPS shall provide Timer Services functions for System and User Applications as follows:

1. Delay until a specified time has elapsed
2. Provide time of day and time of year
3. Provide CDT and MET
4. Delay until a specific GMT, CDT or MET has arrived

(2.2.9.1.3) The CLCS shall provide the capability to define a Test Set Activity which contains a list of the HW (e.g., network resources, subsystems, end item connectivity, etc.), and SW resources (e.g., SCID, TCID, etc.) needed to perform the activity.

(2.2.9.1.4) Test Set Activities shall be capable of being pre-defined, stored for later use, and modified during use.

(2.2.9.1.13) The RTPS shall provide the capability to configure users' workstations for selected activities

(2.2.9.1.15) The RTPS shall provide the capability to load and initialize the following Software in each subsystem of the Test Set:

1. Platform load
2. Subsystem Load (SCID)
3. Test SW Load (TCID)

(2.2.9.1.16) The RTPS shall provide the O&M operator with the capability to select, load, monitor load progress, verify the load, and initialize all Software required in the Test Set.

(2.2.9.1.17) The RTPS shall provide automated load capabilities for platform, subsystem, and test loads.

(2.2.9.1.18) The RTPS shall provide the capability to make real-time configuration updates/modifications portions of SCIDs and TCIDs without requiring a complete reload of the SCID or TCID.

(2.2.9.1.19) The RTPS shall provide the capability to verify the integrity of loaded software (i.e., presence, revision and CRC of required modules).

(2.2.9.1.20) The RTPS shall provide the capability to verify the integrity of software loaded in a Test Set environment at any time without impact to real-time operations.

1.4 System Services Enhancement Thread Hardware Diagram

Not Applicable.

1.5 System Services Enhancement Thread Deliverables

Deliverable	R&D Document	Code	API Manual	Users Guide
Access Control/Security	Yes	Yes	No	Yes
Operation Systems	Yes	Yes	No	Yes
Timer Services	Yes	Yes	Yes	Yes
Network Services	No	No	No	No
IPC	Yes	Yes	COTS	COTS
Applications Services	Yes	Yes	Yes	No
Command Support	Yes	Yes	No	Yes
OPS Configuration Manager	Yes	Yes	Yes	Yes

1.6 System Services Enhancement Thread Assessment Summary

This section contains the summary of the costs and labor involved in implementing this thread. It is broken into three sections. The first is a summary of the individual CI (CSCI and HWCI) labor assessments. The second is a summary of hardware costs. The third is a summary of procurement activities needed.

1.6.1 Labor Assessments

The total Labor Costs required to provide this capability are summarized in the following table:

No.	CSCI/HWCI Name	Thor LM	Changes covered in
1	System Services CSCI - Access Control/Security CSC	6.0 LM	
2	System Services CSCI - Operating Systems CSC	12.0 LM	
3	System Services CSCI - Timer Services CSC	21.0 LM	
4	Applications Services CSCI	0.0 LM	
5	Command Support CSCI	0.0 LM	
6	System Services CSCI - Network Services CSC	0.8 LM	
7	System Services CSCI - IPC CSC	9.0 LM	
8	System Control CSCI - OPS Configuration Manager CSC	30.0 LM	
	TOTAL	**64.8 LM**	

1.6.2 COTS Software Costs

Item Number	Name	Unit Cost (List Price)	Qty.	Total	Assumptions
1	CORBA Dev. License	$3,000	10	$30,000	New Buy

Item Number	Name	Unit Cost (List Price)	Qty.	Total	Assumptions
2	CORBA Run-time License	$295	55	$16,225	New Buy
3	C++ Class Library Licenses	$395	30	$11,850	New Buy

1.6.3 System Services Enhancement Thread Procurement

An initial CORBA COTS product will be procured and deployed to support EIM and TAS development and run-time execution. A final CORBA COTS product will also be procured for the start of the Atlas development.

Procurement Activity	Completion Date
Select Thor CORBA Product	9/19/97
Submit Purchase Request to Procurement	9/30/97
Purchase Request Placed with Vendor	10/14/97
Receive CORBA product/licenses	11/14//97
Complete Atlas Trade Study	1/20/98
Select Altas CORBA Product	1/21/98
Submit Purchase Request to Procurement	2/1/98
Purchase Request Placed with Vendor	2/15/98
Receive CORBA product/licenses	3/15/98

1.7 System Services Enhancement Thread Schedule & Dependencies

1.7.1 Schedule

Task Name	Start	Finish
Concept Panel Internal Review		9/16/97
Concept Panel		9/18/97
Thor Development		
ACS Requirement Panel	9/19/97	10/24/97
ACS Design Panel	10/27/97	11/20/97
OS Combined Requirement/Design Panel	9/19/97	10/24/97
Timer Services Requirement Panel	9/19/97	10/17/97
Timer Services Design Panel	10/20/97	11/20/97
IPC Requirement Panel	9/19/97	10/17/97
IPC Design Panel	10/20/97	11/13/97
SSV CSCI Unit Testing	12/9/97	1/23/98
SSV CSCI Development Integration Test	12/19/97	1/31/98
SSV CSCI Formal Integration Test	1/12/98	2/13/98
Application Services Requirements Panel	9/19/97	10/30/97
Application Services Design Panel	10/31/97	11/20/97
Application Services CSCI Unit Testing	1/12/98	1/16/98
Application Services CSCI Development Integration Test	1/19/98	1/23/98
Application Services CSCI Formal Integration Test	1/26/98	1/30/98
Command Support Requirements Panel	9/19/97	10/16/97
Command Support Design Panel	10/17/97	11/6/97
Command Support CSCI Unit Testing	1/22/98	2/2/98
Command Support CSCI Development Integration Test	2/2/98	2/6/98
Command Support CSCI Formal Integration Test	2/9/98	2/13/98

Task Name	Start	Finish
OPS CM Requirement Panel	9/22/98	10/30/98
OPS Design Panel	10/31/98	12/05/98
SCT CSCI Unit Testing	11/4/97	1/23/98
SCT CSCI Development Integration Test	1/26/98	2/13/98
SCT CSCI Formal Integration Test	2/16/98	2/27/98

1.7.2 Dependencies

No.	Dependency Area	Dependency	Need Date
1	SE	Need OPS concept for initializing a test set using the central master console and the test set master console.	10/3/97
2	Net Svcs	Need design for connectivity between the central master console and the test set master console.	10/3/97
3	Command Mgmt	Definition of command service to deliver timer commands to central timer server on CCP	11/1/97

1.8 System Services Enhancement Thread Simulation Requirements

N/A.

1.9 System Services Enhancement Thread Integration and System Test

The following major capabilities will be tested in the IDE:

- Verify access control and auditing policies have been implemented.
- Verify the proper operation of the OS download tool enhancements
- Verify timer services API functionality.
- Verify CDT/MET operation.
- Verify local timer services via Command displays.
- Verify GMT synchronization of CLCS platforms.
- Verify the installation and operation of a CORBA product.
- Verify new OPS CM functions for loading and initializing platforms without a user login.

1.10 System Services Enhancement Thread Training Requirements

1.10.1 Training Needed

1. CORBA product training 10 persons

1.10.2 Training to be provided

1. User training on changes to OPS CM user interfaces.
2. User training on timer services displays and CDT/MET control.

1.11 System Services Enhancement Thread Facilities Requirements

N/A.

1.12 Travel Requirements

From	To	Reason	No. People	Duration	Est. Date or Frequency

From	To	Reason	No. People	Duration	Est. Date or Frequency
Houston	KSC	Work with users to define timer services requirements.	1	5 days	Oct 97
Houston	KSC	Present Timer Services Design Panels	1	4 days	DP2
Houston	KSC	Present Timer Services Design Panels	1	4 days	DP3
Houston	KSC	Perform integration and CIT	2	3 weeks	Jan 98
Houston	KSC	Work with users to define OPS CM requirements.	1	5 days	Oct 97
Houston	KSC	Present OPS CM Design Panels	1	4 days	DP2
Houston	KSC	Present OPS CM Design Panels	1	4 days	DP3
Houston	KSC	Perform OPS CM integration and CIT	3	3 weeks	Feb 98

1.13 System Services Enhancement Thread Action Items/Resolution

1. The function to provide the allocation of command authority to a C&C WS is not being provided in Thor. Do we need to establish the infrastructure for this process so that Thor applications can begin to code to the interface that will provide the command authorization data? What CSCI/CSC has this responsibility?

2. CSCI Assessments

2.1 System Services CSCI Assessment

The system services CSCI will provide new functionality for the following CSCs: access control/security, Operating Systems, Timer Services, Network Services and Interprocess Communications.

Access Control/Security CSC Work Required

The ACS CSC will perform the following functions in support of this thread:

- Define access control policies
- Define security policies. Some preliminary features are:
    1. Limit SUID programs
    2. Take Least Privilege Access approach with program permissions
    3. Disable all services not explicitly needed
    4. Export NFS mount points with the least privileges required
    5. Enhance protection of servers
    6. Maintain current releases of vendor patches
- Define audit policies.
- Implement defined policies
- Provide procedures/tools for gathering and analyzing audit/security data.
- Support will be provided to the CLCS DPI security accreditation and risk assessment.

Operating Systems CSC Work Required

The OS CSC will perform the following functions in support of this thread:
OS Download Tool

- Reduce the size of an operational load.
- Determine required components for operational load.
- Determine required components for development load.
- Incorporate baseline changes from Redstone.
- Investigate implementing Net/Boot/CM server single machine.
- Incorporate security policies into baseline for development and operational sets.

Help Desk

- Develop help desk procedures
- Man help desk during normal working hours.
- Resolve user problems and issues.

Timer Services CSC Work Required

The Timing Services CSC will provide a set of timer services to CLCS applications and CLCS users in support of this thread. These services will include the following capabilities.

Local Timer Support

- Get current UTC time
- Get current CDT/MET
- Generate an application interrupt after delay of specified time
- Generate an application interrupt when UTC equals specified time
- Generate an application interrupt when CDT equals specified time
- Generate an application interrupt when MET equals specified time

CDT/MET Support

- CDT/MET hold at specified UTC
- CDT/MET hold immediately
- CDT/MET start count at specified UTC
- CDT/MET start count immediately
- CDT/MET set to value
- Convert CDT to MET at T-0
- Cancel pending CDT/MET commands

The local timer server will interface with Applications Services to receive local timer requests. The central timer server will interface with Command Management to receive CDT/MET timer requests.

Network Services CSC Work Required

Network services will modify the NTP configuration as required based on Thor network architecture changes.

Interprocess Communications (IPC) CSC Work Required

The IPC CSC will provide a COTS CORBA product as an enhancement to the existing IPC services. Activities required to provide this enhancement are as follows:

- Support procurement of the Thor CORBA product
- Install and test CORBA product
- Support user integration with CORBA product
- Manage CORBA licenses
- Develop and test data logging filter
- Perform a trade study of various CORBA products for the Atlas delivery
- Support procurement of the Atlas CORBA product
- Procure a COTS C++ class library

CSCI Assessment

CSC Name	CSC Labor (LM)	% of CSC
Access Control/Security	6.0	80%
Operating Systems	12.0	95%
Timer Services	21.0	75%
Network Services (NTP)	0.8	100%

CSC Name	CSC Labor (LM)	% of CSC
IPC	9.0	75%

Basis of estimate

The Timer Services CSC will be based on reusing the currently ported MCC timing services software. Any software not planned to be used in CLCS will be deleted and about x.x KSLOC will be modified or added. The IPC cost is based on experience with similar COTS product evaluations and installations.

Documentation

Document Type	New/Update	Number of Pages
Access Control/Security		
Requirements and Design Documentation	New	5
Users Guide	New	15
Test Procedure	New	15
Operating Systems		
Requirements and Design Documentation	Update	2
Users Guide	Update	5
Test Procedure	Update	10
Timer Services		
Requirements and Design Documentation	New	10
Users Guide	New	30
API Interface Document	New	20
Test Procedure	New	20
Network Services		
Test Procedure	Update	2
Interprocess Communications		
Requirements and Design Documentation	Update	2
Users Guide	COTS	
API Interface Document	COTS	
Test Procedure	New	10

Assumptions

1. Only limited licenses will be procured for the Thor CORBA product.
2. Command will provide a new capability to route timer commands to the central timer server.

Open Issues

None.

2.2 Application Services CSCI Assessment

Applications services will provide a set of APIs to support CLCS timer service functions.

Work Required

Provide a set of APIs to perform the following timer services:

- Get current UTC time
- Get current CDT/MET
- Generate an application interrupt after delay of specified time
- Generate an application interrupt when UTC equals specified time
- Generate an application interrupt when CDT equals specified time
- Generate an application interrupt when MET equals specified time

- CDT/MET hold at specified UTC
- CDT/MET hold immediately
- CDT/MET start count at specified UTC
- CDT/MET start count immediately
- CDT/MET set to value

Basis of estimate

The timer service APIs will be developed in C++ and will consist of about xxxx SLOC.

Documentation

The following documentation will be produced.

Document Type	New/Update	Number of Pages
Requirements and Design Documentation	Update	5
API Interface Document	Update	15
Test Procedure	New	15

Assumptions

None.

Open Issues

None.

2.3 Command Support CSCI Assessment

Command Support will provide a set of displays to access local and central timer services functions.

Work Required

Local Timer Display

- Provide an interface to define and view local count up/down timers based on UTC, CDT, MET or elapsed time.
- Provide an interface to stopwatch function

CDT/MET Control Display

- Provide a graphical interface to the CDT/MET control functions. These functions include:
    1. CDT/MET hold at specified UTC
    2. CDT/MET hold immediately
    3. CDT/MET start count at specified UTC
    4. CDT/MET start count immediately
    5. CDT/MET set to value
    6. Convert CDT to MET at T-0
    7. Cancel pending CDT/MET commands
    8. Enable user to control CDT/MET
    9. Restrict user from control of CDT/MET

These displays will interface with Applications Services.

Basis of estimate

These displays will be developed in the C language and will consist of about xxxx SLOC.

Documentation

The following documentation will be produced.

Document Type	New/Update	Number of Pages
Requirements and Design Documentation	New	10
Users Guide	New	15
Test Procedure	New	10

Assumptions

-

Open Issues

None.

2.4 System Control CSCI Assessment

There are a couple of major changes in these OPS CM areas for Thor. They include:

- The elimination of positional login at the Command & Control Workstations (CCWS).
- The division of Activity Manager functionality from one location (the Test Set Master HCI) to several locations.

System Control - OPS CM (System Services) Work Required

- Remove positional login support.
- Provide a mechanism to initialize system and test software on a platform without a local user login.
- Add support platform groups when defining an activity.
- Provide support for defining/modifying/saving SCT for a test set.
- Provide support for using the SCT as an input to the activity definition process.
- Provide support for user initiation of a software baseline verification.
- Provide enhancements to the repository management tools.

Basis of estimate

Tasks	Labor (LM)	SLOC
Positional Login changes	4.5	700
Changes to Activity Manager / Download & Initialization based on test set initialization design changes for Thor		
Master and Test Set Controller software	4.5	725
Workstation software	4.5	725
Adding definition of Download Groups	3.0	500
Activity Manager support for multiple platforms (by platform)	5.0	800
PPT and API upgrades/completion	4.25	675
Repository Manager upgrades/completion	4.25	675
Totals:	**30.0**	**4800**

Documentation

The following documentation will be produced for System Control - OPS CM.

Document Type	New/Update	Number of Pages
Requirements and Design Documentation	New	50
Users Guide	New	20
API Interface Document	New	5
Interface Design Document	New	30
Test Procedure	New	100

Assumptions

- The OPS CM Server in the SDEs and IDE can simultaneously communicate with the RTCN and DCN.
- The APIs for AM/CLM (RM) will not change when the network switches from ATM to Fast Ethernet/FDDI.

Open Issues

None.

3. HWCI Assessments

N/A.

4. COTS Products Dependencies

4.1 SW Products Dependency List

Product Name	Quantity Needed	Need Date
CORBA product	15 development licenses 9 server run-time licenses 44 client run-time licenses	11/17/97

4.2 HW Products Dependency List

N/A.